

APPENDIX K

Wind Erosion Modeling

12/04/2008
Black Rock Geothermal Site
Worley Parsons

Summary of Wind Erosion Calculation Assumptions:

The project site is located directly to the west of the Salton Sea in Imperial County California. Existing conditions of the site consist of cultivated farm land planted with Alfalfa. The two major types of soil on the site are Holtville Silty Clay and Glenbar Silty Clay Loam. They consist of 78.3 acres and 123.3 acres respectively.

The program used to calculate the total wind erosion soil loss was WEPS (Wind Erosion Prediction System) provided by the USDA Natural Resources Conservation Service. This program calculates the total soil loss from wind erosion using climate, wind, soil and site management data.

For the post construction conditions only 63.1% of the sites soil will be left in the existing condition. A berm around the whole site will be from 0-4 feet in height to prevent the 100 year flood from inundating the site. The berm will help in reducing the soil loss due to wind so this factor was entered into the parameters for calculating the soil loss. The area used to calculate the post construction soil losses was 63.1% of the total site area due to that being the only areas that will have soil exposed to the wind. The remaining portion of the site will be covered in Geothermal power plant equipment and concrete mat foundations.

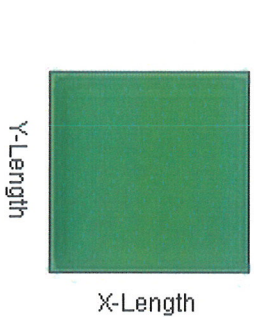
The results from the WEPS program for pre-construction conditions for wind erosion soil loss are as follows. For the Holtville Silty Clay soil the total is 509 tons/year and for the Glenbar Silty Clay Loam soil it is 534 tons/year. Pre-construction conditions consisted of bare soil and no berm around the entire site that will decrease wind erosion.

The results from the WEPS program for total wind erosion soil loss for post-construction conditions of the entire power block was 148 tons/year for the Holtville Silty Clay soil type and 172 tons/year for the Glenbar Silty Clay Loam. These results and the data parameters are summarized in the attached Run Summary reports created by the WEPS program.

Run Summary: Black Rock 1_38

Run Date: Thursday 04 December 2008 04:15 PM
Client Name: Black Rock (Pre-construction)
Farm No: --- **Tract No:** --- **Field No:** ---
Run Location: C:\Documents and Settings\Jonas.Dahlgren\My Documents\WEPS
Management: SD_BareSoil-TEST.man
Soil: Glenbar_106_85_CL.ifc

Simulation & Site Information

	X-Length: 208.66 ft Y-Length: 208.66 ft	Mode: DATES
	Area: 4.35 ft ² Elevation: -118.11 ft Orientation: 0.00 ?	State: California County: Imperial Location: 33.03? N, 115.29? W Cligen: BRAWLEY Windgen: IMPERIAL

Erosion

Period	Crop	Gross Loss tn/ac	Net Soil Loss From Field (tn/ac)			
			Total	Creep/Salt.	Suspension	PM10
Rot. year: 1		4.33	4.33	3.488	0.845	0.035
Ave. Annual		4.33	4.33	3.488	0.845	0.035

SCI Summary

Soil Conditioning Index	-0.1410	Wind Erosion Soil Loss	4.3364	tn/ac	
Energy Calculator	0.0000	gal diesel/ac	Water Erosion Soil Loss	0.0000	tn/ac
Average Annual STIR	0.0000	SCI Subfactors			
		OM	FO	ER	
		-1.0000	1.0000	-0.7072	

Rotation Stir Energy

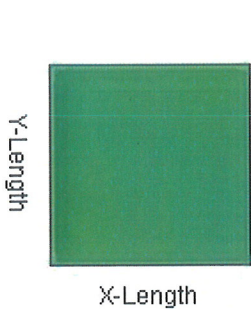
Date	Operation	Crop	Stir	Energy gal diesel/ac
Jan 01, 01	Begin weed growth	no crop	0.00	0.00

Notes

Run Summary: Black Rock 1_37

Run Date: Thursday 04 December 2008 04:15 PM
Client Name: Black Rock (Pre-construction)
Farm No: --- **Tract No:** --- **Field No:** ---
Run Location: C:\Documents and Settings\Jonas.Dahlgren\My Documents\WEPS
Management: SD_BareSoil-TEST.man
Soil: Holtville_110_85_SIC.ifc

Simulation & Site Information

	X-Length: 208.66 ft Y-Length: 208.66 ft	Mode: DATES
	Area: 4.35 ft ² Elevation: -118.11 ft Orientation: 0.00 ?	State: California County: Imperial Location: 33.03? N, 115.29? W Cligen: BRAWLEY Windgen: IMPERIAL

Erosion

Period	Crop	Gross Loss tn/ac	Net Soil Loss From Field (tn/ac)			
			Total	Creep/Salt.	Suspension	PM10
Rot. year: 1		6.51	6.51	4.109	2.404	0.079
Ave. Annual		6.51	6.51	4.109	2.404	0.079

SCI Summary

Soil Conditioning Index	-0.3130	Wind Erosion Soil Loss	6.5169 tn/ac
Energy Calculator	0.0000 gal diesel/ac	Water Erosion Soil Loss	0.0000 tn/ac
Average Annual STIR	0.0000		

SCI Subfactors

OM	FO	ER
-1.0000	1.0000	-1.5658

Rotation Stir Energy

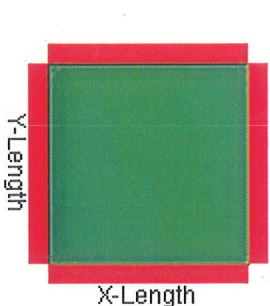
Date	Operation	Crop	Stir	Energy gal diesel/ac
Jan 01, 01	Begin weed growth	no crop	0.00	0.00

Notes

Run Summary: Black Rock 1_31

Run Date: Thursday 04 December 2008 11:36 AM
Client Name: Black Rock(Post - Construction)
Farm No: --- **Tract No:** --- **Field No:** ---
Run Location: C:\Documents and Settings\Jonas.Dahlgren\My Documents\WEPS
Management: SD_BareSoil-TEST.man
Soil: Holtville_110_85_SIC.ifc

Simulation & Site Information

	X-Length: 165.68 ft Y-Length: 165.68 ft	Mode: DATES
	Area: 2.75 ft ² Elevation: -118.11 ft Orientation: 0.00 ?	State: California County: Imperial Location: 33.03? N, 115.29? W Cligen: BRAWLEY Windgen: IMPERIAL

Erosion

Period	Crop	Gross Loss tn/ac	Net Soil Loss From Field (tn/ac)			
			Total	Creep/Salt.	Suspension	PM10
Rot. year: 1		2.39	1.89	1.202	0.690	0.024
Ave. Annual		2.39	1.89	1.202	0.690	0.024

Barriers

Location	Type	Height ft	Width ft	Porosity fraction
North	<mod> Fence, solid	2.00	18.01	0.05
East	<mod> Fence, solid	2.00	18.01	0.05
South	<mod> Fence, solid	2.00	18.01	0.05
West	<mod> Fence, solid	2.00	18.01	0.05

SCI Summary

Soil Conditioning Index	0.0510	Wind Erosion Soil Loss	1.8928	tn/ac	
Energy Calculator	0.0000	gal diesel/ac	Water Erosion Soil Loss	0.0000	tn/ac
Average Annual STIR	0.0000	SCI Subfactors			
		OM	FO	ER	
		-1.0000	1.0000	0.2548	

Rotation Stir Energy

Date	Operation	Crop	Stir	Energy gal diesel/ac
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Rotation Stir Energy

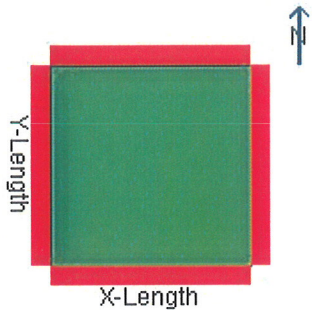
Date	Operation	Crop	Energy	
			Stir	gal diesel/ac
Jan 01, 01	Begin weed growth	no crop	0.00	0.00

Notes

Run Summary: Black Rock 1_32

Run Date: Thursday 04 December 2008 11:36 AM
Client Name: Black Rock(Post-construction)
Farm No: --- **Tract No:** --- **Field No:** ---
Run Location: C:\Documents and Settings\Jonas.Dahlgren\My Documents\WEPS
Management: SD_BareSoil-TEST.man
Soil: Glenbar_106_85_CL.ifc

Simulation & Site Information

	X-Length: 165.68 ft Y-Length: 165.68 ft	Mode: DATES
	Area: 2.75 ft ² Elevation: -118.11 ft Orientation: 0.00 ?	State: California County: Imperial Location: 33.03? N, 115.29? W Cligen: BRAWLEY Windgen: IMPERIAL

Erosion

Period	Crop	Gross Loss tn/ac	Net Soil Loss From Field (tn/ac)			
			Total	Creep/Salt.	Suspension	PM10
Rot. year: 1		1.93	1.40	1.126	0.274	0.011
Ave. Annual		1.93	1.40	1.126	0.274	0.011

Barriers

Location	Type	Height ft	Width ft	Porosity fraction
North	<mod> Fence, solid	2.00	18.01	0.05
East	<mod> Fence, solid	2.00	18.01	0.05
South	<mod> Fence, solid	2.00	18.01	0.05
West	<mod> Fence, solid	2.00	18.01	0.05

SCI Summary

Soil Conditioning Index	0.0900	Wind Erosion Soil Loss	1.4012	tn/ac	
Energy Calculator	0.0000	gal diesel/ac	Water Erosion Soil Loss	0.0000	tn/ac
Average Annual STIR	0.0000	SCI Subfactors			
		OM	FO	ER	
		-1.0000	1.0000	0.4483	

Rotation Stir Energy

Date	Operation	Crop	Stir	Energy gal diesel/ac
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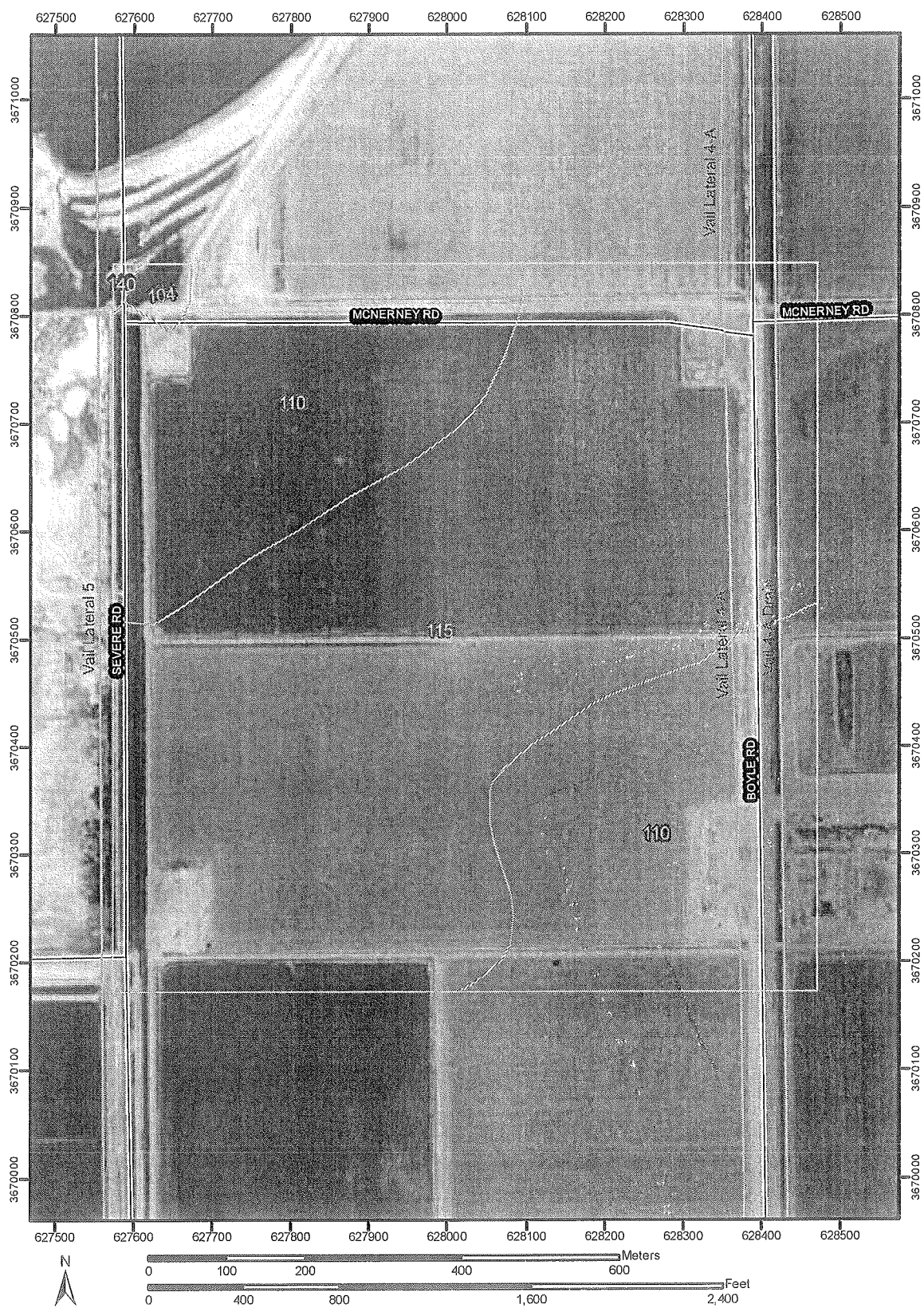
Rotation Stir Energy

Date	Operation	Crop	Energy	
			Stir	gal diesel/ac
Jan 01, 01	Begin weed growth	no crop	0.00	0.00

Notes

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Soil Map—Imperial County, California, Imperial Valley Area
(Black Rock Geothermal Site)











































Natural Resources
Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

10/7/2008
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MAP LEGEND

Area of Interest (AOI)	Very Stony Spot
 Area of Interest (AOI)	 Very Stony Spot
Soils	 Wet Spot
 Soil Map Units	 Other
Special Point Features	Special Line Features
 Blowout	 Gully
 Borrow Pit	 Short Steep Slope
 Clay Spot	 Other
 Closed Depression	Political Features
 Gravel Pit	 Municipalities
 Gravelly Spot	 Cities
 Landfill	 Urban Areas
 Lava Flow	Water Features
 Marsh	 Oceans
 Mine or Quarry	 Streams and Canals
 Miscellaneous Water	Transportation
 Perennial Water	 Rails
 Rock Outcrop	Roads
 Saline Spot	 Interstate Highways
 Sandy Spot	 US Routes
 Severely Eroded Spot	 State Highways
 Sinkhole	 Local Roads
 Slide or Slip	 Other Roads
 Sodic Spot	
 Spoil Area	
 Stony Spot	

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 11N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Imperial County, California, Imperial Valley Area

Survey Area Data: Version 5, Jul 25, 2008

Date(s) aerial images were photographed: 9/26/1992

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Imperial County, California, Imperial Valley Area (CA683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
104	FLUVAQUENTS, SALINE	1.3	0.6%
110	HOLTVILLE SILTY CLAY, WET	78.3	38.5%
115	IMPERIAL-GLENBAR SILTY CLAY LOAMS, WET, 0 TO 2 PERCENT SLOPES	123.3	60.7%
140	TORRIORTHENTS-ROCK OUTCROP COMPLEX, 5 TO 60 PERCENT SLOPES	0.3	0.1%
Totals for Area of Interest (AOI)		203.2	100.0%